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Does entrepreneurial learning translate into personal initiative in the workplace? A role congruity perspective

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ABSTRACT

Drawing on role congruity theory (RCT), we posit that entrepreneurial learning (EL) fosters employees' personal initiative (PI) due to the congruity between entrepreneurial qualities and the employee role. We further investigate contingencies that shape such congruity, thereby affecting the EL–PI relationship: individual-level (gender) and firm-level (size and age) characteristics. Using data from 5,564 working students drawn from the "Global University Entrepreneurial Spirit Students' Survey" (GUESSS), our regression analyses confirm that EL fosters PI. This effect is more positive for male employees, since gendered role expectations limit the congruity between entrepreneurial qualities and PI in females. Additionally, the positive EL–PI relationship is more pronounced in employees in larger and older firms, as the employee roles in these organizations display greater congruity with entrepreneurial qualities. Our findings extend research on EL, which has traditionally focused on new venture creation, by showing that EL enhances employees' PI in existing organizations.

1. Introduction

Personal initiative (PI) is a form of extra-role behavior that encompasses proactiveness and self-starting actions (Frese et al., 1996; Rieger et al., 2023). Employees who demonstrate PI take independent steps to improve their work environment, anticipate future challenges, and persistently pursue organizational goals (Frese et al., 1996; Frese & Fay, 2001). PI has been widely recognized for its positive impact on both employee and organizational performance, such as enabling middle managers to effectively navigate the complexities and uncertainties of their roles (Glaser et al., 2016), improving employees' service performance (Rank et al., 2007), and enhancing employees' job performance by cultivating social networks that provide the necessary resources and autonomy to engage in high-level initiatives (Thompson, 2005). Consequently, organizations implement various processes and practices to foster PI among employees, including resource provision (Salanova & Schaufeli, 2008), supportive leadership (De Dreu & Nauta, 2009), and job designs that encourage autonomy and proactive behaviors (De Dreu & Nauta, 2009; Fay & Frese, 2001).

However, while there is extensive research examining PI as being cultivated through experiences within organizational settings (e.g., Bledow & Frese, 2009; Fay & Frese, 2001; Wihler et al., 2017), to the best of our knowledge, there is a surprising lack of understanding regarding how PI can be developed in the educational context – particularly during university studies. This knowledge gap is increasingly relevant, as employers expect university graduates to possess not only technical competencies but also soft skills and PI to navigate dynamic work environments (Antonazzo et al., 2025; Zahn et al., 2024). Understanding how universities can foster PI is crucial to to aligning academic learning with the skills required in the workplace.

To advance this discussion, we focus on entrepreneurial learning (EL) at university as a key antecedent of PI. EL refers to the acquisition of qualities, such as skills and attitudes, that enable individuals to seize and act upon opportunities (Cope, 2005; Politis, 2005; Souitaris et al., 2007). While the implications of EL have traditionally been examined by focusing on venture creation and related outcomes (e.g., Nabi et al., 2017; Souitaris et al., 2007), its implications may extend beyond founding careers, potentially shaping employees' behaviors in existing organizations (Braunerhjelm & Lappi, 2023; Hahn et al., 2022, 2025; Rieger et al., 2023). Surprisingly, however, we lack knowledge on how EL translates into actual behaviors in employment settings, despite the potential application of these entrepreneurial capabilities in wage

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employment (Alsos et al., 2023; Steira et al., 2024). Consequently, the link between EL and employees' PI remains puzzling. Even though EL fosters PI in the context of venture creation efforts (e.g., Souitaris et al., 2007), PI in organizational settings differs fundamentally from that in venture creation. Whereas founding a company involves becoming one's own boss (Carter et al., 2003), PI within firms often requires employees to navigate predefined roles and expectations (Feng et al., 2024) while still exhibiting proactive behaviors (Covin et al., 2020; Fay & Frese, 2001). This contrast motivates the central research question of our study: *What is the relationship between EL and employees' PI?*

To answer this question, we draw on role congruity theory (RCT), which explains how behaviors emerge based on the congruity between individuals' qualities and the roles they perform in organizations (del Carmen Triana et al., 2024). RCT posits that behaviors are more likely to manifest when they align with role-based expectations (Eagly & Karau, 2002). Applying RCT to the relationship between EL and PI, we hypothesize that the entrepreneurial qualities developed through EL align with the expectations of proactive and self-starting employees, leading to a positive relationship between EL and employees' PI. However, this relationship is not uniform across all individual and organizational contexts. RCT suggests that congruity between personal qualities and role expectations is shaped by both individual and contextual factors (Um et al., 2022). To capture these boundary conditions, we consider three key moderators encompassing individual (i.e., gender) and firm characteristics (i.e., firm size and firm age). In particular, since gendered role expectations influence the perceived congruity between EL-induced qualities and employee roles (Eagly & Karau, 2002), we hypothesize that the positive relationship between EL and PI is more positive for male compared to female employees. Furthermore, since larger and older firms generally expect their employees to fulfill specific roles that embody entrepreneurial qualities (Mayson & Barrett, 2006), we hypothesize that the positive relationship between EL and PI is more positive in these firms.

We test our hypotheses using data from 5,564 working students employed in new ventures in their earlier and later stages. This empirical setting is especially relevant because working students generally have limited prior work experience, allowing us to isolate the effects of EL acquired at university (Clarysse et al., 2022). Moreover, new ventures are a relevant organizational setting given our focus on working students. These new firms – regardless of their stage – are still in a phase of rapid change and adaptation (Colombo et al., 2016; Lichtenstein & Brush, 2001), creating situations where even employees with limited experience may contribute by refining workflows, optimizing processes, and introducing small but meaningful organizational improvements. We use data from the "Global University Entrepreneurial Spirit Students' Survey" (GUESSS), one of the largest international surveys on university students' EL and careers (e.g., Bogatyreva et al., 2019; Gimenez-Jimenez et al., 2021; Laspita et al., 2023; Shirokova et al., 2021).

This study makes three key contributions to the literature. First, we contribute to the literature on PI by identifying EL as a novel antecedent of PI. Second, we extend the EL literature, exploring its implications for employment contexts and highlighting its relevance for broader career trajectories. Finally, we contribute to the growing stream of research on behavioral adaptation arising from within-role congruity (del Carmen Triana et al., 2024; Um et al., 2022). Specifically, our findings on the moderating role of gender suggest that when individuals navigate multiple roles (e.g., as employees or gendered individuals), their behavioral adaptations result from a complex interplay between within- and between-role incongruity – namely, the alignment (or misalignment) of entrepreneurial qualities with gendered and employee role expectations.

2. Literature review

Before addressing the research question of this study – What is the relationship between EL and employees' PI? – this section reviews the relevant literature on PI and EL to position our contribution, explain the gap that this research question addresses, and, therefore, motivate our study.

2.1. Personal initiative

PI is broadly defined as a proactive, self-starting, and persistent behavioral tendency by individuals to go beyond formally prescribed tasks to drive improvements and positive change in their work environment (Frese et al., 1996; Rieger et al., 2023). As noted in prior research (e.g., Rooks et al., 2016), PI in contexts outside of existing organizations can be closely linked to the creation and development of new ventures, primarily because it entails proactive, self-starting, and innovative behaviors. Furthermore, PI is particularly relevant in existing firms (Frese et al., 1996; Frese & Fay, 2001), where employees' PI is defined as "a behavior syndrome resulting in an individual's taking an active and self-starting approach to work and going beyond what is formally required in a given job" (Frese et al., 1996, p. 38). As such, employees' PI is a form of extra-role behavior and focuses predominantly on proactive activities that are consistent with the organization's mission, have a long-term orientation, are goal-directed and action-oriented (Frese et al., 1996; Frese & Fay, 2001), and do not necessarily involve commercial implications, such as in intrapreneurship (Frese et al., 1996). For example, PI includes employees' behaviors, such as submitting suggestions to improve work (Fay & Frese, 2001), pursuing work standards that exceed stated standards (Frese et al., 2007), attending non-required training or educational sessions on their own time (Fay & Frese, 2001), taking initiative immediately, even when others do not (Bledow & Frese, 2009; De Dreu & Nauta, 2009; Luksyte et al., 2022), and generally tending to do more than is required from them (De Dreu & Nauta, 2009).

Employees' PI has received attention from studies in organizational behavior, human resource management, and strategic management, since it plays an important role in enhancing job performance and organizational effectiveness (e.g., Glaser et al., 2016; Rank et al., 2007; Thomas et al., 2010). For example, we know that PI improves job performance by enabling employees to tackle the complexities and uncertainties of their job (Glaser et al., 2016) and improving their ability to develop social networks (Thompson, 2005). The positive relationship between PI and job performance was also confirmed by a *meta*-analysis performed by Thomas et al. (2010). The role played by PI in enhancing job performance has also been reflected in studies linking employees' PI to overall organizational effectiveness, thereby further reinforcing the importance of cultivating PI among the workforce (Fay & Frese, 2001). Rank et al. (2007) found that employees who demonstrated higher levels of PI were more proactive in anticipating and resolving customer needs, which led to improved service performance and overall organizational effectiveness.

Therefore, since employees who demonstrate PI in their behavior are valuable to organizations (e.g., Frese et al., 1996; Thomas et al., 2010), it is important to understand how employee PI can be fostered. Prior research indicates that organizational factors play a key role as antecedents of employee PI. For example, organizational factors that foster PI include job resources, a justice-based climate, supportive leadership, and an organizational climate that encourages initiative (De Dreu & Nauta, 2009; Salanova & Schaufeli, 2008; Wihler et al., 2017). However, far less is known about how PI can be fostered throughout an individual's educational journey. This gap is both practically and theoretically significant. From a practical standpoint, organizations increasingly seek and reward employees who demonstrate PI upon entering the workforce (Covin et al., 2020; Fay & Frese, 2001; Liang et al., 2025; Parker et al., 2010). From a theoretical perspective, given that PI is strongly associated with individual qualities (De Dreu & Nauta, 2009) and considering that educational environments and learning experiences significantly shape these qualities (Glaub et al., 2014; Nabi et al., 2017), education could serve as a foundational setting for PI

development. Preliminary evidence indicates that specific educational programs can foster PI among business owners, reinforcing the idea that learning experiences may be instrumental in cultivating proactive behaviors (Glaub et al., 2014). However, to the best of our knowledge, there is no work examining how education and learning influence employees' PI once they enter the workforce. To address this gap, we focus on a key learning outcome that can be cultivated during university studies: EL.

2.2. Entrepreneurial learning

For entrepreneurs, EL is defined as the experiential process through which the knowledge and confidence to identify and act upon entrepreneurial opportunities are acquired (Cope, 2005; Politis, 2005; Souitaris et al., 2007). In recent decades, universities have increasingly offered a combination of experiential learning opportunities, mentorship programs, and hands-on coursework to stimulate EL among university students (e.g., Hahn et al., 2017; Mele et al., 2022; Souitaris et al., 2007). Examples include entrepreneurship education (Hahn et al., 2020), curricular or extracurricular challenge-based learning (Mele et al., 2022; Secundo et al., 2020), exposure to entrepreneurial labs, student-led entrepreneurship organizations, and entrepreneurship professors who nurture students' EL (Cascavilla et al., 2022; Mele et al., 2022; O'Connor, 2013) by engaging students in real-world entrepreneurial tasks. To assess the outcomes of these efforts, scholars have developed the concept of EL outcomes for university students (Hahn et al., 2017), encompassing the acquisition of entrepreneurial skills and attitudes through university offerings: a deeper understanding of the confidence, values, and motivations of entrepreneurs; the development of practical management skills; the ability to build and leverage networks; and the capacity to identify and evaluate opportunities (Souitaris et al., 2007).

In this manuscript, we draw on this conceptualization of EL to examine the entrepreneurial skills and attitudes cultivated in university settings. At the same time, we acknowledge that EL has been conceptualized in various ways across different streams of literature, for example not only as an outcome involving the acquisition of entrepreneurial knowledge, skills, and attitudes, but also as a process, such as experiential learning or learning-by-doing (Cope, 2005; Politis, 2005). While this study adopts an outcome-based perspective aligned with prior work on entrepreneurship education (Hahn et al., 2017; Souitaris et al., 2007), we recognize that EL can also contribute to capability development at other levels of analysis. At the firm level, for instance, recent studies suggest that the innovative potential of external learning and knowledge spillovers is contingent upon the internal capabilities of the organization, such as absorptive capacity (Audretsch et al., 2024). Our study complements this view by examining how EL outcomes developed in educational settings can shape employees' proactive behaviors in the workplace.

To date, research has primarily examined the effects of EL on venture creation and its antecedents, such as entrepreneurial intention (Bae et al., 2014; Steira et al., 2024). This body of work suggests that EL fosters self-efficacy, opportunity identification, and proactive behavior, culminating in the PI required to embark on venture creation (Nabi et al., 2017; Pocek et al., 2021; Souitaris et al., 2007). Given this strong link between EL and proactive behaviors, it stands to reason that EL could also play a crucial role in fostering PI among employees. However, despite the growing interest in the broader applicability of EL (Steira et al., 2024), with few exceptions (Alsos et al., 2023), studies have largely overlooked its implications for students entering wage employment (Hahn et al., 2022). This research gap is both theoretically and practically significant. On one hand, entrepreneurial skills and attitudes cultivated through EL can be valuable assets for employees in organizations (Braunerhjelm & Lappi, 2023; Lindbjerg & Vladasel, 2025). On the other hand, leveraging these qualities in structured employment settings is not straightforward. Unlike entrepreneurs, employees must navigate organizational hierarchies, role expectations, and performance systems while adapting their entrepreneurial qualities to align with company norms (Feng et al., 2024; Kacperczyk & Younkin, 2022; Waddingham et al., 2024). This raises our core research question: *What is the relationship between EL and employees' PI?*

3. Theory and hypotheses

3.1. Role congruity theory

To develop hypotheses regarding the relationship between EL and PI in employees, we draw on RCT, which is grounded in role theory and social role theory and offers a theoretical framework to explain how the *congruity* between an individual's *qualities* and the *expectations* associated with their role influences organizational and social outcomes (Eagly & Karau, 2002). Originally developed by Eagly and Karau (2002) to examine prejudice against female leaders, RCT has since been extended to a broader range of management and entrepreneurship research (del Carmen Triana et al., 2024). Scholars have applied this theory to study phenomena such as career progression (Merluzzi & Phillips, 2022), fundraising success (Pistilli et al., 2023), and hiring decisions involving former entrepreneurs (Feng et al., 2024).

Central to RCT is the notion that every role in society is accompanied by stereotypical expectations that shape how individuals are perceived and evaluated (del Carmen Triana et al., 2024; Eagly & Karau, 2002). These expectations can be distinguished into two categories (del Carmen Triana et al., 2024): *descriptive norms*, which capture shared assumptions about the behaviors typically exhibited by individuals in a given role, and *injunctive norms*, which reflect the behaviors that the individuals performing this role are expected to demonstrate. The extent to which an individual's qualities align with these injunctive norms determines their perceived congruity within their role and, consequently, affects their outcomes within the organizational context.

A significant body of research has explored *between-role congruity*, which examines how individuals performing multiple roles navigate the alignment between the descriptive expectations of one role and the injunctive expectations of another (del Carmen Triana et al., 2024). For example, this line of inquiry has been particularly relevant in understanding biases against female leaders and entrepreneurs (e.g., Eagly & Karau, 2002). The perceived incongruity between stereotypically feminine traits – such as communality and nurturance – and the agentic qualities expected of leaders or entrepreneurs – such as assertiveness, risk-taking, and dominance – has been identified as a key explanatory factor in the challenges faced by females in terms of career advancement, leadership evaluations, and entrepreneurial funding (e.g., Acar & Sümer, 2018; Merluzzi & Phillips, 2022).

More recently, scholars have extended RCT to explore *within-role congruity*, which focuses on the alignment between the qualities an individual displays and the injunctive expectations associated with a single role (Feng et al., 2024). For instance, Um et al. (2022) showed that the congruity between bankers' expectations regarding the communication style of CFOs and the actual linguistic patterns used by these executives significantly influenced their evaluations. Feng et al. (2024) found that recruiters' assessments of former entrepreneurs varied based on their perceived fit with traditional employee expectations. These studies suggest that within-role congruity plays a crucial role in shaping how individuals are perceived and how they adapt their behaviors to align with role expectations.

Regardless of whether incongruity arises between multiple roles or within a single role, RCT highlights its impact on both bias and *behavioral adaptation* (Eagly & Karau, 2002). In particular, behavioral adaptation describes individuals adjusting their behaviors to align their qualities with the expectations of a given role (del Carmen Triana et al., 2024). Specifically, when incongruity occurs, individuals tend to adapt their behaviors to achieve greater congruity between their qualities and the injunctive norms of their role. For example, female leaders often

adopt more agentic and assertive behaviors, such as displaying dominance, decisiveness, and confidence, to align with the traditionally masculine expectations associated with leadership roles (Rudman, 1998). Conversely, when congruity ensues, individuals are likely to adapt by naturally reinforcing behaviors aligned with their intrinsic qualities and role expectations. For instance, male leaders, whose qualities are often stereotypically aligned with leadership norms, may reinforce their assertiveness, decisiveness, and risk-taking behaviors, as these traits are expected and rewarded within leadership roles (Eagly & Karau, 2002).

While other theoretical frameworks could offer complementary insights, in this study, RCT provides a valuable framework to examine the relationship between EL and PI in employees. For instance, social role theory (Eagly & Wood, 2012) provides a valuable account of how gendered expectations emerge from social structures and the division of labor. However, it does not explicitly address how individuals adapt their behavior in response to the congruity or incongruity between their qualities and professional role expectations, as RCT does. Similarly, self-determination theory (Deci & Ryan, 2000) focuses on motivational processes and psychological needs that drive proactive behaviors like PI, but it lacks a mechanism to explain how the alignment between individual qualities and role-based norms shapes behavioral outcomes. In contrast, RCT explicitly theorizes how congruity between personal qualities and role expectations triggers adaptive behavioral responses. This makes RCT a conceptually appropriate lens to investigate how within-role congruity – between the qualities developed through EL and the injunctive norms of employee roles – translates into PI, a process that can be understood as behavioral adaptation. Building on this perspective, we formulate hypotheses on the EL–PI relationship in employees.

3.2. Entrepreneurial learning and personal initiative

Drawing on RCT, we hypothesize that the skills and attitudes developed through EL are congruent with the expectations associated with the employee role and that such congruity fosters PI as a behavioral adaptation. EL cultivates key competencies, such as confidence, motivations, practical management skills, and the ability to build and leverage networks, which enable individuals to identify and act on value-creating opportunities (Souitaris et al., 2007; Steira et al., 2024). These skills and attitudes may equip employees with the ability to recognize innovative solutions to workplace challenges and implement them autonomously and proactively (Covin et al., 2020; Feng et al., 2024; Lindbjerg & Vladasel, 2025). In particular, recognizing opportunities – as facilitated by EL – can trigger self-directed and goal-oriented behaviors such as PI, by activating internal goals that prompt individuals to act upon opportunities (Frese & Gielnik, 2023). As such, opportunity recognition capabilities developed through EL represent a valuable individual quality that can foster employees' proactive efforts beyond formal role requirements.

For these EL-induced qualities to effectively translate into PI, they must align with the role expectations placed on employees. To understand this alignment, it is necessary to distinguish between descriptive and injunctive norms in the specific case of the employee role. Descriptive norms define the formal tasks and responsibilities expected of employees, such as handling customer relationship management (CRM) duties. Conversely, injunctive norms encompass behaviors that are increasingly expected and rewarded in organizations, such as engaging in extra-role behaviors that contribute to organizational improvement and innovation (Covin et al., 2020; Fay & Frese, 2001; Liang et al., 2025; Parker et al., 2010). For instance, an employee handling CRM tasks is not only expected to execute given responsibilities but also encouraged to proactively enhance customer engagement strategies.

The qualities developed through EL are naturally aligned with these norm-based expectations, as the skills and attitudes fostered – such as proactively searching for and actively seizing opportunities to improve one's job – enable employees to fulfill expectations regarding exceeding formal job requirements (Botelho & Chang, 2023). This congruity influences behavioral adaptation, leading employees who have undertaken EL to better align their actions with the injunctive norms. Consequently, employees with EL-driven qualities are more likely to exhibit PI in their behaviors, leveraging their confidence, motivations, practical management skills, and networks to recognize opportunities, take initiative, and drive improvements within their organizations. Based on this reasoning, we hypothesize as follows:

H1: Entrepreneurial learning is positively associated with personal initiative in employees.

3.3. Contingencies in the relationship between entrepreneurial learning and personal initiative

Thus far, we have hypothesized that EL fosters PI in employees due to the congruity between EL-driven qualities and employee role expectations, particularly injunctive norms. To further explore the nuances of this relationship, we introduce key contingencies that shape this congruity by altering the injunctive norms typically associated with employees in relation to PI-related behaviors. RCT emphasizes that within-role congruity and associated behavioral outcomes are shaped by two broad categories of factors (Um et al., 2022).

The first pertains to the individual occupying the role. The congruity between an individual's qualities and the role they occupy can be judged based on how the individual is viewed by others. For instance, Um et al. (2022) showed that the lack of congruity between a CFO's language and role is evaluated differently when the CFO is viewed as more reputable working in more reputable firms. In this study, we focus on gender as a moderating factor, as gender encapsulates role-specific expectations (del Carmen Triana et al., 2024; Pistilli et al., 2023) that influence the perceived congruity between EL-driven qualities and employee roles (Kacperczyk & Younkin, 2022), thereby shaping the behavioral adaptations leading to PI. While prior research indicates that men and women may experience and internalize EL differently (Padilla-Angulo et al., 2022) and that men generally report higher EL outcomes when exposed to similar offerings (Bergman et al., 2011; Ferreras-Garcia et al., 2021), this paper does not focus on the antecedents or determinants of EL. Instead, we complement this line of work by exploring gender not as a driver of EL, but as a boundary condition of its behavioral outcomes. Specifically, we investigate how gendered role expectations moderate the relationship between EL and PI, thereby shaping how male and female employees translate EL-driven qualities into proactive behaviors in the workplace.

The second category of factors relates to the broader social milieu in which a role is embedded. In various organizational contexts, specific qualities are more or less rewarded, shaping the degree of congruity between an individual's qualities and role expectations. For instance, Um et al. (2022) showed that the lack of congruity between a CFO's language and role is evaluated less negatively when it aligns with the broader social milieu reflected in the CEO's linguistic style. In this study, we consider firm size and age as milieu factors that moderate the EL–PI relationship. Firms of differing sizes and ages tend to have distinct employee role expectations (Cardon & Stevens, 2017; Koryak et al., 2015), influencing the degree to which EL-driven qualities align with employee roles and the extent to which these qualities translate into PI. In sum, Fig. 1 visually presents our hypotheses.

3.3.1. The moderating effect of gender

RCT emphasizes that specific demographic groups hold expectations that transcend into their professional roles (del Carmen Triana et al., 2024; Pistilli et al., 2023). For instance, female leaders, despite occupying roles that demand agentic qualities such as assertiveness and decisiveness, are often negatively evaluated when they conform to these expectations because they contradict the communal characteristics traditionally associated with their gender (Rudman, 1998; Shockley

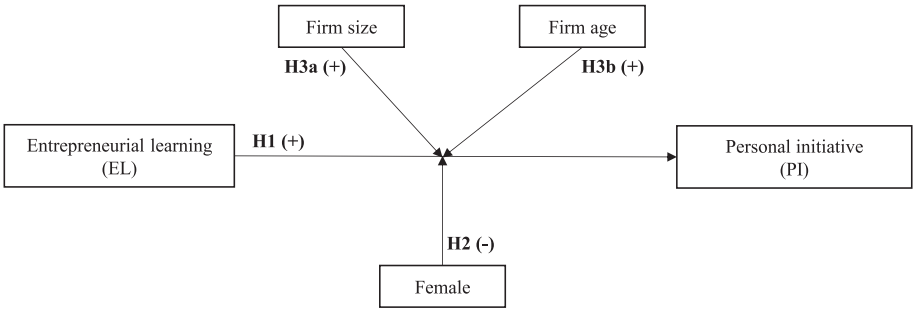


Fig. 1. Hypotheses.

et al., 2017). This tension arises from a misalignment between descriptive norms (expectations about female communal nature) and injunctive norms (expectations about leadership qualities).

Similarly, we hypothesize that gendered expectations shape the perception of employees' PI-related behaviors. Male employees are typically expected to exhibit proactiveness, autonomy, and risk-taking (Eagly & Karau, 2002; Ruiz et al., 2023), qualities that align closely with the competencies fostered through EL (Cope, 2005; Politis, 2005; Souitaris et al., 2007). As a result, EL-driven qualities are perceived as more congruent with injunctive expectations of male employees. This reinforces their likelihood of leveraging skills and attitudes developed through EL to engage in PI-related behaviors.

Conversely, female employees are often expected to exhibit communal behaviors, such as cooperation, modesty, and deference to hierarchy (Eagly & Karau, 2002; Garcia-Retamero & López-Zafra, 2006; Kacperczyk & Younkin, 2022). These expectations may create perceived incongruity between EL-driven qualities and injunctive norms for female employees, making it less likely for them to leverage EL to display PI in their behaviors. Thus, while EL may provide both male and female employees with similar attitudes and skills, the extent to which they translate these skills into PI depends on the degree of role congruity, which differs between genders. Based on these arguments, we hypothesize as follows:

H2: Gender moderates the relationship between entrepreneurial learning and personal initiative in employees, such that the relationship is more positive for male than for female employees.

3.3.2. The moderating effects of firm size and age

The extent to which employee role expectations align with EL-driven qualities is influenced by the organizational context in which the role is embedded (Hahn et al., 2022; Mahieu et al., 2021). While firms – large or small, old or young – may encourage PI in similar ways, they might do so within distinct injunctive norms that shape the degree of congruity between EL-driven qualities and employee role expectations.

Larger and older firms tend to have more resources, particularly larger firms, and structured environments, particularly older firms, than smaller and younger ones (Baldridge & Burnham, 1975; Radfard et al., 2023). We hypothesize that due to these features, while these firms may not necessarily promote PI more than smaller or younger firms, they provide a work environment where EL-driven qualities align more strongly with role expectations. Whereas descriptive norms in larger and older firms tend to portray employees as narrowly focused on specific tasks (e.g., an employee focusing solely on CRM rather than handling both CRM and accounting), injunctive norms often reward employees who can innovate within their specific functions (Covin & Miles, 2022). This makes entrepreneurial skills particularly relevant, as they enable employees to deviate from routine task execution and proactively seek improvements beyond descriptive role expectations (Bosma et al., 2019; Kacperczyk & Marx, 2016). For instance, the employees in these firms may be rewarded for proactively improving processes within their assigned roles, such as a CRM specialist identifying more effective ways to engage with customers. Moreover, larger and older firms frequently implement structured innovation programs that explicitly reward employees who distinguish themselves by proactively identifying and proposing workplace improvements (Liang et al., 2025; Vanacker et al., 2021). These programs signal that in such contexts, EL-driven qualities – such as opportunity identification and exploitation – are strongly aligned with injunctive role expectations.

Conversely, employees in smaller and younger firms operate within a different set of norm-based expectations regarding proactive and self-starting behaviors. While these firms often offer greater flexibility in job roles, their limited resources and less structured environments shape the degree of congruity between EL-driven qualities and role expectations. Due to resource constraints and loosely defined job roles, employees are frequently expected to handle multiple responsibilities simultaneously (Elfenbein et al., 2010). While this can encourage employees to go beyond strictly defined job requirements, it also means that entrepreneurial qualities enabling innovation in the workplace may receive less formal recognition or reward (Mahieu et al., 2021). Unlike in larger and older firms, where structured systems (such as innovation programs) explicitly reward employees for innovating within their function (Liang et al., 2025; Radfard et al., 2023; Vanacker et al., 2021), employees in smaller and younger firms may find that their PI-related efforts are absorbed into executing multiple routine tasks rather than creatively tackling opportunities for improving them. This reduces the congruity between EL-driven qualities and the injunctive norms of employee roles. As a result of such limited congruity, we hypothesize that in smaller and younger firms, employees are less likely to take advantage of EL qualities to perform PI-related behaviors. We hypothesize as follows:

H3a: Firm size moderates the relationship between entrepreneurial learning and personal initiative, such that the relationship is more positive in larger firms than in smaller firms.

H3b: Firm age moderates the relationship between entrepreneurial learning and personal initiative, such that the relationship is more positive in older firms than in younger firms.

4. Methodology

4.1. Sample

To test our hypotheses, we used data from GUESSS, which is a leading research project in the field of university students' EL, which periodically collects survey data from a large international sample of university students (e.g., Bogatyreva et al., 2019; Gimenez-Jimenez et al., 2021; Laspita et al., 2023; Shirokova et al., 2021). The richness of GUESSS data has been exploited in several studies published in top entrepreneurship and innovation journals examining various aspects of university students' learning, career, and entrepreneurship, such as the impact of family support in start-up activities (Edelman et al., 2016), the impact of entrepreneurial education on EL (Hahn et al., 2017), the cultural aspects of entrepreneurship (Bogatyreva et al., 2019), and the role of entrepreneurship education on career intentions (Laspita et al., 2023). GUESSS data on university students are particularly suitable for

our study, as we sought to examine the impact of the university environment on employee PI. By focusing on working students – university students who, alongside their studies, are employed in new ventures – we can better isolate the effect of university learning experiences on PI in employees. Since working students typically have little or no prior work experience, their PI is less likely to be influenced by workplace exposure and remains closely tied to their university learning experiences. Moreover, given our focus on university students, new ventures represent a particularly relevant organizational setting to study employee PI. These firms – regardless of their stage (i.e., younger vs. older) – are still in a phase of rapid change and adaptation (Colombo et al., 2016; Lichtenstein and Brush (2001)), creating situations where even employees with limited experience may contribute by refining workflows, optimizing processes, and introducing small but meaningful organizational improvements. This dynamic environment makes new ventures an ideal context to examine the EL–PI relationship among employees at an early career stage.

We used data from the 2018 GUESSS survey in which 208,636 students from 54 countries and more than 3,000 universities participated. We chose this GUESSS survey wave because it included a scale of extra-role behaviors from Pearce and Gregersen (1991) that allowed us to assess working students' PI in their firm of employment. In our analysis, we only included students who, at the time of the survey, were employed and reported information about their employer, for which we had full information about our variables of interest. In addition, in our main analyses, consistent with our focus on new ventures, we focused on university students whose employers were in operation for a maximum of eight years. After removing the observations for which the variables of interest were not defined and were evident outliers (e.g., employers with more than 500 employees), we ended up with a sample of 5,564 working students. They were on average about 25 years old, and 53 % were female.

4.2. Variables

4.2.1. Dependent variable

In order to assess the dependent variable (PI), we began with a 10-item, 7-point Likert scale based on Pearce and Gregersen (1991) from the 2018 GUESSS survey (see Table A1 in the Appendix), which had previously been used to measure extra-role behaviors, including PI. This scale also included different extra-role behaviors beyond PI, such as helping behaviors (Bolino & Grant, 2016; Podsakoff et al., 2000). An exploratory factor analysis on this 10-item scale led to two main factors. The first included the first five items regarding behaviors related to employees' PI, such as actions that go beyond the basic requirements of the job to improve work quality, performance, and efficiency. We applied principal component factor analysis and, based on the Kaiser (1958) criterion (eigenvalues > 1), we extracted one factor, which explained 54.71 % of the variance. The items from 1 to 5 captured in the first factor assessed behaviors reflecting active and proactive engagement with tasks that are not explicitly required but were intend to contribute to the organization's performance or success. Thus, these behaviors expressed PI within organizations (Bledow & Frese, 2009; De Dreu & Nauta, 2009; Fay & Frese, 2001; Frese et al., 2007; Luksyte et al., 2022). The second factor included items from 6 to 10, which focus on helping others and supporting colleagues and the organization as a whole. They represent altruistic or cooperative extra-role behaviors that contribute to a positive work environment, even if the actions involved do not constitute formal requirements. The items from 6 to 10 were, thus, aligned with the altruistic and cooperative dimensions of extra-role behavior (Bolino & Grant, 2016; Podsakoff et al., 2000); therefore, we did not use them, since our focus was on PI as a specific form of extra-role behavior.

Thus, after the factor analysis, we computed our dependent variable PI as the factor score derived from the five measured items related to the first factor. The scale proved reliable, with Cronbach's alpha equal to 0.79 (Noora, 2021).

4.2.2. Independent variable

EL was measured through the validated 5-item scale proposed by Souitaris et al. (2007) and presented in the GUESSS survey. In particular, respondents indicated their level of agreement (1 = strongly disagree, 7 = strongly agree) with statements regarding their studies, such as "The courses and offerings I attended increased my understanding of the attitudes, values, and motivations of entrepreneurs;" "The courses and offerings I attended enhanced my ability to develop networks;" and "The courses and offerings I attended increased enhanced my ability to identify an opportunity.". Based on an exploratory factor analysis, all items could be loaded on a single factor, with an eigenvalue of 3.95, confirming the validity of the scale for our sample. Furthermore, Cronbach's alpha was equal to 0.93, giving us confidence about the reliability of the scale.

4.2.3. Moderator variables

We built three moderators based on the GUESSS responses to the survey: one moderator variable at the individual level, *female*, and the remaining two at the organizational level, *firm size* and *firm age*. The individual-level moderator *female* was coded as 1 if the respondent was female and 0 if the respondent was male. While we acknowledge that this female–male dichotomy reflects biological sex rather than gender, we follow the approach adopted in prior GUESSS-based studies (e.g., Clinton et al., 2024), which use sex to capture gender-based expectations. The organizational-level moderator variable assessing the employer's size (*firm size*) was a continuous variable based on the number of individuals working in the firm. The other organizational-level moderator variable assessing the employer's age (*firm age*) was a continuous variable based on the number of years the firm had been in operation.

4.2.4. Control variables

At the individual level, we controlled for the respondents' *age*, *field of study*, and *level of study*. Regarding the *field of study*, we included three dummy variables linked to *business, economics, and law* (BECL), *natural sciences and medicine* (NSM), and *social sciences and cultural studies* (SSC).[1] We used SSC as the base case in the analysis. For the *level of study*, we created a dummy *bachelor's* as equal to 1 if the respondent studied at the bachelor's level (0 otherwise). Moreover, at the individual level, we also controlled for the respondents' company positions. We created three dummy variables: *low-level position* for respondents who reported roles such as apprentice or intern; *medium-level position* for those who declared a mid-level position in the company; and *upper-level position* for respondents who declared a managerial position. We used *low-level position* as the base case. Finally, we included industry- and country-fixed effects in each of our models. In Table A2 of the Appendix, we present the description of our the variables.

4.3. Main estimation procedures

Given the multi-level nature of our dataset (cf. Hahn et al., 2017), we analyzed the data using a multi-level mixed-effects regression approach clustered by universities. The integration of individual-level and group-level variables within a single model can present challenges due to the non-random nature of within-group individual observations, potentially resulting in biased and inefficient estimations. Given that our dataset

[1] Following the GUESSS convention (Sieger et al., 2014), BECL includes Business / Management, Economics, and Law; NSM includes Engineering (incl. Architecture), Human Medicine / Health Sciences, Mathematics, and Natural Sciences; SSC includes Arts / Humanities (e.g., cultural studies, history, linguistics, philosophy, religion), Science of Art (e.g., art, design, dramatics, music), and Social Sciences (e.g., psychology, politics, education).

comprised individual-level observations clustered within universities, we chose a multi-level mixed-effects regression approach encompassing both random and fixed effects (Rabe-Hesketh & Skrondal, 2008).

Moreover, in the regression model, we standardized all continuous variables before computing interaction terms (i.e., EL, firm size, and firm age) to reduce multicollinearity problems. We also checked for multicollinearity using the variance inflation factor (VIF) between our variables. For all the regression models, the maximum VIF value was 2.34, indicating that multicollinearity was not a concern in our results (Johnston et al., 2018).

Since the dependent and independent variables of our model were survey-based, we took both a priori and ex-post measures to mitigate common method bias (Podsakoff et al., 2003). First, the GUESSS survey spreads variables across a long survey to prevent respondents from anticipating the research questions and adapting their responses accordingly (Braun & Sieger, 2021); furthermore, it assures respondents of strict confidentiality and anonymity (Podsakoff et al., 2003). Second, following other studies (e.g., Kammerlander et al., 2015), we conducted exploratory factor analysis to ensure that no single dominant factor could explain the variance in our sample, which would suggest the presence of common method bias. Further, the data structure proposed in the study fit the data significantly better than a model with a single dominant factor, as shown by confirmatory factor analysis. Finally, the sample was tested for non-recall bias in prior studies (Hahn et al., 2021).

4.4. Additional analyses

We are aware that the results of our main estimates may be susceptible to self-selection. Since the dependent variable (PI in employees) could be observed only for working students, we sampled only relevant university students. However, these students might have selected themselves into universities that provided more EL. Thus, we sought to verify that the results were not biased by self-selection and performed a two-step Heckman procedure (Certo et al., 2016; Heckman, 1976) to correct for self-selection bias. In the first step, we used a probit specification to estimate the likelihood of a student being employed at the time of the survey, calculating the corresponding inverse Mills ratio to be included in the second-stage outcome equations (i.e., having PI as the dependent variable).

In addition, we addressed a second form of endogeneity arising from self-selection: the selection into larger firms. Larger firms might afford to attract smarter and more initiative-taking students (Mahieu et al., 2021; Mayson & Barrett, 2006). To tease out this form of endogeneity, we used an instrumental variables approach (Bascle, 2008) using a two-stage modeling strategy, followed by a Durbin–Wu–Hausman test, as in previous studies based on GUESSS data (e.g., Sieger & Minola, 2017).

Third, since the main analysis focused on new ventures and included only university students whose employers were in operation for a maximum of eight years and had less than 500 employees, we repeated the analysis without these restrictions for robustness.

Finally, we verified our results by running different economic specifications. In particular, we performed two linear model regressions as robustness specifications, with standard errors clustered at the university and country levels, respectively.

5. Results

5.1. Main results

Tables 1 and 2 provide the descriptive statistics. Table 1 shows the number of observations, means, standard deviations, and minimum and maximum values for each variable, whereas Table 2 contains the correlation matrix. Table 2 shows that none of the pair-wise correlation coefficients reaches the threshold value of 0.66, excluding correlations between the dummy variables representing mutually exclusive categories. These results further rule out the possible multicollinearity in our models, as previously indicated by the VIF test.

Table 1
Descriptive statistics.

	Variables	Obs.	Mean	Std. dev.	Min	Max
1	Personal initiative (PI)	5,564	0.00	0.91	−3.05	1.34
2	Field of study: BECL	5,564	0.43	0.50	0	1
3	Field of study: NSM	5,564	0.36	0.48	0	1
4	Field of study: SSC	5,564	0.20	0.40	0	1
5	Level of study: bachelor	5,564	0.80	0.40	0	1
6	Age	5,564	24.58	4.73	18	40
7	Position: low-level	5,564	0.32	0.47	0	1
8	Position: medium-level	5,564	0.54	0.50	0	1
9	Position: upper-level	5,564	0.14	0.34	0	1
10	Female	5,564	0.53	0.50	0	1
11	Firm size	5,564	41.92	83.26	1	500
12	Firm age	5,564	3.42	2.44	0	8
13	Entrepreneurial learning (EL)	5,564	4.69	1.61	1	7

Table 3 presents the regression analyses performed to test our research hypotheses. In Model 1, we tested the baseline model, which included control and moderator variables but excluded the independent variable and interaction terms. The dummies associated with the BECL field of study show a positive and significant coefficient (0.076, $p < 0.05$), suggesting that working students in this field of study are more likely to engage in PI compared to those in SSC (baseline). The variable age is positive and statistically significant (0.009, $p < 0.01$), suggesting that older working students engage in PI to a greater extent. Furthermore, we found a negative and significant effect (−0.084, $p < 0.01$) of the variable female on the likelihood of engaging in PI, suggesting that, on average, females display lower PI compared to males. Finally, the coefficients associated with job position show that the medium- and upper-level dummies are positive and significant: working students at higher levels of the hierarchy are, on average, more likely to engage in PI compared to employees in lower positions (baseline). In Model 2, we tested Hypothesis 1. In Model 3, we tested the interaction effect of EL with the individual-level female moderator (Hypothesis 2), and in Models 4 and 5, we conducted separate tests of the interaction effect of EL with the organizational-level moderators, namely firm size and firm age (Hypotheses 3a and 3b). In Table 3, Model 6 displays the full model with all moderators and interaction terms included simultaneously. Finally, Table 4 shows simple slopes as well as 95 % confidence intervals of the EL-PI relationship at different levels of the moderators to facilitate the interpretation of the interaction effects obtained in the full model (Model 6).

In Model 2, the regression results show a positive and significant relationship between EL and PI, with the EL coefficient being positive and significant (0.211, $p < 0.01$) and remaining consistently so through all the other models (3–6). Hypothesis 1 is thus supported. Furthermore, the coefficient of EL suggests that a one–standard-deviation (SD) increase in EL is associated with an increase of 0.21 in PI.

Regarding the moderation effect of gender in Model 3, the coefficient of the interaction between EL and female is negative and significant (−0.052, $p < 0.05$). It remains so also in the full model (Model 6). As predicted by Hypothesis 2, the relationship between PI and EL is thus negatively moderated by the female variable, such that EL has a more positive effect on PI for males compared to their female counterparts. The simple slopes of the EL-PI relationship for female vs male employees (Table 4) indicate the following: while a one-SD increase in EL is associated with a 0.240 increase in PI for males, the corresponding increase for females is 0.188, indicating a 22 % reduction in the effect of EL on PI for females compared to males. To visually interpret this result, Fig. 2 shows the effect of EL on PI for males versus females based on the full model, with 95 % confidence intervals. As shown in Fig. 2, the confidence intervals for the predicted values of males' and females' PI do not overlap at higher levels of EL, with males exhibiting significantly higher

Table 2
Correlation table.

		1	2	3	4	5	6	7	8	9	10	11	12	13
1	Personal initiative	1												
2	Field of study: BECL	0.017	1											
3	Field of study: NSM	0.011	−0.663*	1										
4	Field of study: SSC	−0.033*	−0.440*	−0.381*	1									
5	Level of study: bachelor	−0.060*	0.047*	−0.027*	−0.020	1								
6	Age	0.102*	−0.023	−0.004	0.033*	−0.211*	1							
7	Position: low-level	−0.173*	−0.031*	0.040*	−0.010	0.102*	−0.210*	1						
8	Position: medium-level	0.019	0.004	−0.028*	0.028*	−0.054*	0.102*	−0.747*	1					
9	Position: upper-level	0.207*	0.036*	−0.013	−0.028*	−0.060*	0.137*	−0.276*	−0.433*	1				
10	Female	−0.085*	0.116*	−0.239*	0.143*	−0.010	−0.040*	−0.002	0.030*	−0.040*	1			
11	Firm size	0.041*	−0.015	0.016	−0.000	−0.061*	0.040*	0.025	0.021	−0.065*	−0.098*	1		
12	Firm age	−0.024	−0.009	0.015	−0.010	−0.038*	0.078*	0.018	0.047*	−0.092*	0.004	0.176*	1	
13	Entrepreneurial learning	0.265*	0.167*	−0.070*	−0.123*	−0.010	0.023	−0.020	−0.022	0.059*	−0.080*	0.110*	0.035*	1

* $p < 0.05$.

Table 3
Multilevel regression models on the determinants of Personal Initiative (PI).

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	PI	PI	PI	PI	PI	PI
Field of study: BECL	0.076**	0.000	0.003	0.004	0.003	0.008
	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)
Field of study: NSM	0.043	0.028	0.030	0.030	0.027	0.031
	(0.035)	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)
Level of study: bachelor	−0.045	−0.033	−0.034	−0.033	−0.032	−0.032
	(0.032)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)
Age	0.009***	0.008***	0.008***	0.008***	0.008***	0.008***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Position: medium-level	0.281***	0.266***	0.265***	0.265***	0.265***	0.263***
	(0.027)	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)
Position: upper-level	0.696***	0.658***	0.657***	0.658***	0.661***	0.658***
	(0.039)	(0.038)	(0.038)	(0.038)	(0.038)	(0.038)
Female	−0.084***	−0.066***	−0.066***	−0.068***	−0.066***	−0.067***
	(0.025)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)
Firm size	0.009	0.002	0.002	−0.011	0.001	−0.011
	(0.013)	(0.012)	(0.012)	(0.013)	(0.012)	(0.013)
Firm age	−0.026**	−0.027**	−0.028**	−0.027**	−0.030**	−0.030**
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Entrepreneurial learning		0.211***	0.240***	0.214***	0.212***	0.241***
		(0.012)	(0.018)	(0.012)	(0.012)	(0.018)
Entrepreneurial learning*female			−0.052**			−0.048**
			(0.023)			(0.023)
Entrepreneurial learning*firm size				0.052***		0.044***
				(0.012)		(0.013)
Entrepreneurial learning*firm age					0.040***	0.036***
					(0.011)	(0.012)
Constant	−0.523***	−0.455**	−0.457**	−0.453**	−0.452**	−0.452**
	(0.184)	(0.182)	(0.182)	(0.181)	(0.180)	(0.180)
Observations	5,564	5,564	5,564	5,564	5,564	5,564
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of groups	939	939	939	939	939	939
Log-likelihood	−7043	−6902	−6900	−6894	−6896	−6887
Wald	661.6	977.7	983.4	999.3	996.1	1018

Standard errors in parentheses.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.
For variable "Field of study" the omitted category is SSC. For the variable "Position," the omitted category is "low-level".
Note: Entrepreneurial learning, firm size and firm age are standardized.

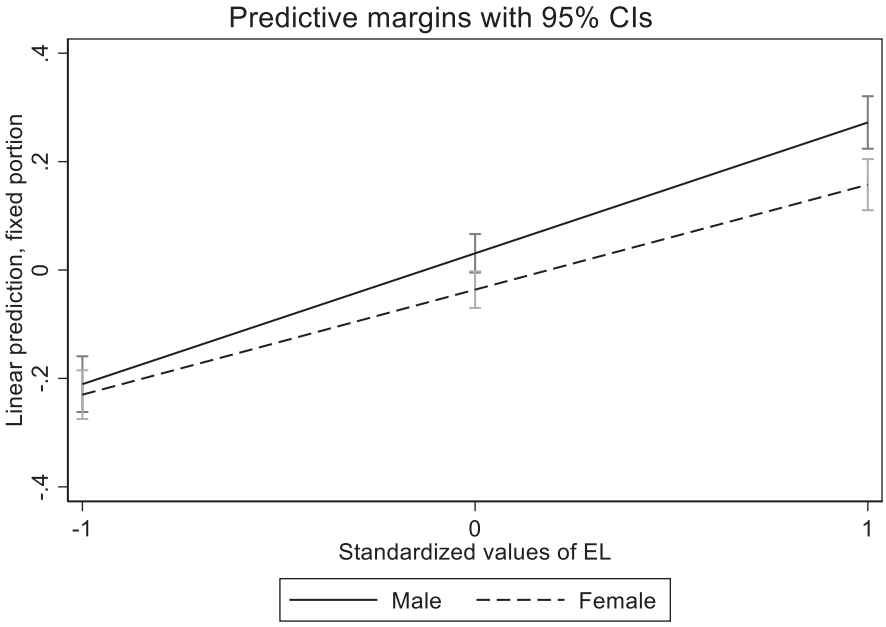
PI than females at high EL but not at lower EL. This illustrates the implications of the effect of EL on PI differing significantly between genders, with higher levels of EL generating a gap between males' and females' PI.

Model 4 shows a positive and significant coefficient of the interaction between employer size and EL (0.052, $p < 0.01$), suggesting that firm size positively moderates the EL–PI relationship. This moderating effect remains positive and significant in the full model (Model 6). The simple slopes in Table 4 allow us to compare the effect of EL on PI in smaller firms (i.e., firm size at the mean – 1 SD) versus larger firms (i.e., firm size

Table 4
Simple slopes.

EL → PI				***EL → PI***				***EL → PI***			
Gender	Coefficient	LLCI	ULCI	*Firm size*	Coefficient	LLCI	ULCI	*Firm age*	Coefficient	LLCI	ULCI
Male	0.240 (0.018)	0.205	0.275	Low	0.172 (0.017)	0.138	0.206	Low	0.180 (0.017)	0.147	0.213
Female	0.188 (0.016)	0.157	0.22	High	0.260 (0.018)	0.225	0.296	High	0.252 (0.017)	0.219	0.286

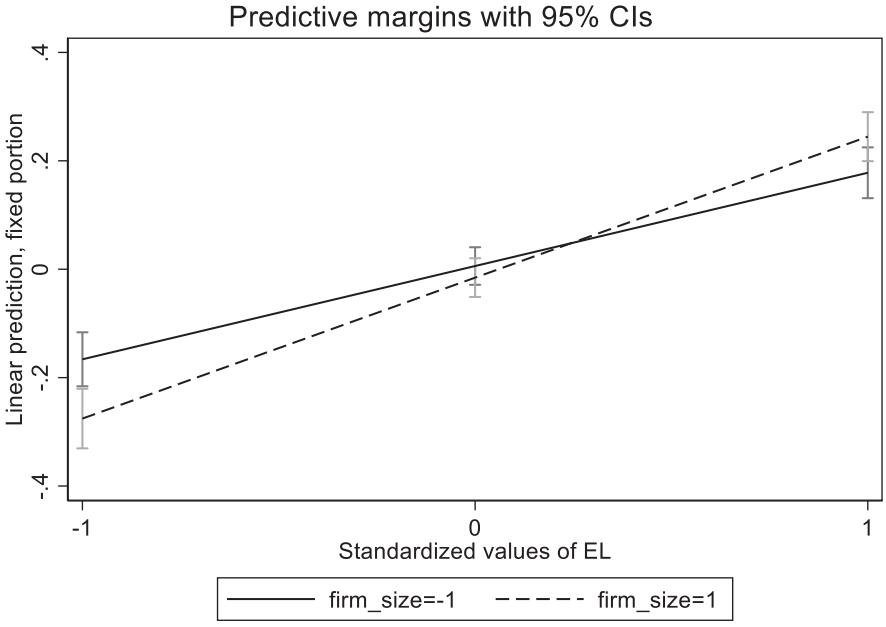
N = 5,564; Standard errors in parentheses; 95 percent confidence intervals. EL = Entrepreneurial learning. PI = Personal Initiative.



Note: EL is standardized

Fig. 2. Gender as a moderator in the relationship between EL and PI. *Note: EL is standardized.*

at the mean + 1 SD): the slopes' coefficients suggest that the effect of a one-SD increase in EL shifts from 0.172 of PI in smaller firms to 0.260 of



Note: EL and firm size are standardized

Fig. 3. Firm size as a moderator in the relationship between EL and PI.

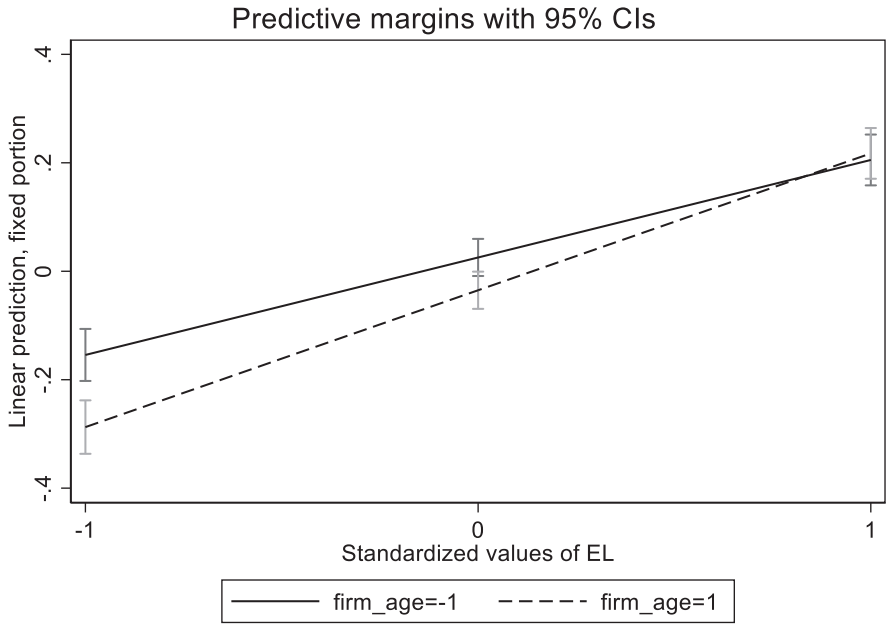
PI in larger firms, representing a 51 % increase. Fig. 3 illustrates the effect of EL on PI in smaller versus larger firms. The margins plot shows that the effect of EL depends on firm size, with a more positive effect observed in larger firms compared to smaller ones. Specifically, while the 95 % confidence intervals do not overlap at lower levels of EL – indicating that PI was significantly higher in smaller firms than in larger ones – this gap disappears at higher levels of EL. This illustrates that EL has a greater effect on PI in larger firms, enabling the employees in these firms to bridge the initial gap in PI observed at lower levels of EL.

Model 5 shows a positive moderating effect between employer age and EL on PI (0.040, $p < 0.01$), which remains positive and significant in the full model (Model 6). When comparing the effect of EL on PI across younger and older firms (i.e., firms with an age of mean – 1 SD vs. firm with an age of mean + 1 SD) in Table 4, the slopes' coefficients indicate that a one-SD increase in EL leads to an increase in PI from 0.180 in younger firms to 0.252 in older firms, reflecting a 40 % greater effect in the latter. Fig. 4 illustrates the effect of EL on PI in younger versus older ventures. The plot displays a pattern similar to that in Fig. 3, suggesting that the effect of EL on PI is more positive in older firms compared to younger ones. Specifically, the 95 % confidence intervals suggest that whereas PI is significantly higher in younger firms at lower levels of EL, this difference became non-significant as EL increased, indicating that EL plays a greater role in fostering PI in older firms. These results together support Hypotheses 3a and 3b, which predicted that the positive effect of EL on employees' PI was more pronounced in larger than smaller and older than younger firms.

5.2. Results from additional analyses

To corroborate our results and mitigate the self-selection concerns described in Section 4.4, we first conducted the two-step Heckman procedure to verify that our results were not biased by the self-selection of the working students of our sample into more entrepreneurial universities. In the first step, to estimate the likelihood of a working student being included in our sample, we used demographic and study-related control variables (gender, age, field, and level of study) in our main model. In addition, we used the number of years spent at university, named as *time at university,* as an exclusionary restriction (i.e., a variable that predicts the probability of working without affecting the probability of engaging in PI). We assumed that those who spent more years at university were more likely to be engaged in employment during their studies, since they had to split their time between studying and working. However, there were no obvious reasons to believe that time spent at university made working students more prone to PI. The variable was significantly correlated with the probability of being a working student, as shown in the first-stage selection equation (see Appendix, Table A3), but not with PI ($p = 0.186$). As a second step, we re-estimated the logit model to predict PI, including the inverse Mills ratio as a covariate. The coefficient of the inverse Mills ratio was not significant, showing that self-selection does not significantly affect our primary findings, which remained consistent with our main analyses (see Appendix, Table A3).

Second, regarding endogeneity arising from unobservable factors potentially affecting both firm size and PI, we used an instrumental variable approach, followed by the Durbin–Wu–Hausman test, to test for the endogeneity of firm size. To be valid instruments, variables must be significantly correlated with the potentially endogenous regressor (i.e., firm size) – instrument relevance – and uncorrelated with the error term in the equation for the dependent variable (i.e., PI) – instrument exogeneity (Kennedy, 2008). In practical terms, this means that the instruments should not directly affect PI, while being significantly correlated with firm size. The number of years the respondent spent at university met these criteria from both conceptual and statistical points of view. Larger firms had more resources to attract students with higher levels of human capital, as reflected in their time spent studying. However, as noted above, there was no clear reason why this factor would directly lead to higher PI. Consistent with this, while the respondents' *time at university* was significantly correlated with firm size ($p = 0.030$), it did not exhibit a significant correlation with PI ($p = 0.186$). Using this instrument, we applied a two-stage least squares estimator and computed the Durbin–Wu–Hausman chi-square test and



Note: EL and firm age are standardized

Fig. 4. Firm age as a moderator in the relationship between EL and PI.

the Wu–Hausman F test. Because both tests were not significant ($p = 0.377$ and $p = 0.380$), we failed to reject the null hypothesis that the variable firm size was exogenous, thereby mitigating concerns about endogeneity.

Third, as mentioned earlier, we replicated the analysis on an extended sample, without restrictions concerning firm age and size. Overall, the results remain largely consistent with the findings from our main analysis, as presented in Table A4 in the Appendix, with some minor deviations. Specifically, Model 3 (Table A4) shows a negative but non-significant coefficient for the interaction between female and EL, which remains negative and reaches significance in Model 6 (Table A4). Additionally, while the full model (Model 6, Table A4) reports a positive but non-significant coefficient for the interaction between firm size and EL, this interaction is positive and significant in Model 4 when other interaction terms are excluded from the regression.

Finally, we used robustness specifications for two linear regression models, with standard errors clustered at the country and university levels, respectively (see Appendix Table A5 for the country cluster and Table A6 for the university cluster). The results remain largely consistent with our main specification, with only minor deviations. For the model with standard errors clustered at the country level (Table A5), the only difference is that Model 4 shows a positive but non-significant coefficient for the interaction between employer size and EL, which remains positive and non-significant in Model 6. In contrast, for the model with standard errors clustered at the university level (Table A6), the results are robust and fully aligned with our main specifications. These minor deviations in the country-clustered model are not a major concern, as our primary modeling approach remains valid. To confirm the appropriateness of our multi-level mixed-effects regression, we also performed a likelihood ratio test comparing the linear regression with the multi-level model. The test results allowed us to reject the null hypothesis that the random effects were equal to zero, reinforcing that the multi-level regression was the more appropriate approach.

6. Discussion

This study addresses a fundamental puzzle: while EL is designed to cultivate skills and attitudes to seize and act on opportunities, its application in employment settings remains unclear. Does EL foster PI in employees, or is its impact confined to founding a company? To address this puzzle, we drew on RCT to hypothesize that qualities developed through EL yield specific behavioral adaptations in employees, who face different expectations compared to entrepreneurs founding their business. We hypothesized that EL promotes PI in employees due to the alignment between entrepreneurial qualities and employee role expectations. Our findings confirm that EL is positively associated with PI within organizations. This finding underscores the versatility of entrepreneurial skills and attitudes, suggesting that the qualities cultivated through EL are valuable not only for founding a business but also for wage-paid employment. While the roles of founders and employees are structurally different, both benefit from common entrepreneurial competencies that enable them to identify and act upon opportunities (Alsos et al., 2023). This supports the idea that EL – whether through education or exposure to entrepreneurial activities – has broader applicability beyond venture creation, reinforcing its value as a tool for fostering initiative-taking employees (Braunerhjelm & Lappi, 2023; Feng et al., 2024; Rieger et al., 2023).

Moreover, our results show that the EL-PI relationship is contingent on critical boundary conditions related to the individual and context. These results shed light on the nuanced ways in which EL translates into employee behaviors. First, we found that gender plays a crucial moderating role, with male employees benefiting more from EL in terms of PI than female employees, likely due to persistent gendered role expectations. This suggests that, rather than mitigating gender disparities in PI, EL may actually amplify the gap, as the proactive behaviors it fosters align more closely with role expectations for males than for females, making it easier for male employees to translate EL-driven qualities into workplace initiative.

Second, firm size and firm age moderate the EL–PI relationship, which becomes more positive in larger and older firms compared to smaller and younger ones. This suggests that EL can equip employees in larger and older organizations with the right attitudes and skills to demonstrate PI, even within structured environments with more specific role requirements. Our results indicate that, on average, these contexts offer less room for PI, but employees with EL can distinguish themselves and bridge the gap in PI compared to their counterparts in more agile, smaller, and younger organizations. This highlights EL as a gap closer, providing larger and older organizations with fresh momentum by fostering an initiative-taking workforce that brings self-starting and proactive behaviors into more structured settings.

6.1. Contributions to research

Our study makes three key contributions to the literature. First, we expand the understanding of PI in employees by identifying EL as a novel antecedent. Prior research has largely examined organizational factors promoting PI within organizations, including resource provision, supportive leadership, and job design (Glaser et al., 2016; Frese & Fay, 2001; Rank et al., 2007; Thompson, 2005). Our study extends this literature by showing that universities can be pivotal in fostering employees' PI. In particular, providing students with skills and attitudes related to entrepreneurship can turn them into employees who are more prone to proactive and self-starting behaviors. This shows that experiences acquired outside the specific context in which PI is applied can serve as a critical antecedent for such behavior.

Second, we contribute to the EL literature by extending its implications beyond new venture creation and its antecedents. To date, research has mostly focused on how EL and activities aimed at fostering EL (e.g., curricular and extra-curricular entrepreneurship education) foster startup activity and its immediate antecedents (e.g., Nabi et al., 2017; Souitaris et al., 2007). Although the qualities developed through EL have potential applications that transcend new venture creation (Alsos et al., 2023; Hahn et al., 2022, 2025; Steira et al., 2024) and can motivate university-wide efforts to promote EL, empirical research on the role of EL in shaping employee behaviors has been surprisingly scarce. We filled this important gap by showing that EL also equips individuals with skills that can enhance their PI as employees in existing organizations.

Finally, we advance RCT by illustrating how within- and between-role incongruity interact to shape behavioral adaptation in employees. While RCT has primarily been applied to explain biases arising from between-role incongruity – such as gender stereotypes affecting leadership evaluations (del Carmen Triana et al., 2024) – our study shifts the focus toward the behavioral consequences of within-role congruity. Specifically, we examine how the alignment between entrepreneurial qualities and employee role expectations influences proactive behavior in organizational settings. Prior research has questioned whether entrepreneurial backgrounds align with employee roles (Botelho & Chang, 2023; Feng et al., 2024; Waddingham et al., 2024), particularly in the context of recruiters' evaluations of potential candidates. Our study challenges this assumption by showing that once employees are embedded within organizations, EL-driven competencies can leverage these skills to exhibit PI, provided that role expectations support proactive behavior. Furthermore, our findings suggest that both individual

and contextual factors shape the degree of role congruity. This reinforces the idea that the extent to which EL translates into PI depends not only on the skills acquired but also on the alignment between these skills and workplace norms. Additionally, we contribute to a more nuanced understanding of how individuals navigate multiple role expectations (e.g., as employees and gendered individuals). Our findings reveal that behavioral adaptations arise from a complex interplay between within- and between-role incongruity – namely, how entrepreneurial qualities align (or misalign) with gendered and employee role expectations. This perspective provides further nuances in how role congruity leads to behavioral adaptation.

6.2. Limitations and future research directions

While our study provides novel insights, it has certain limitations that future research should address. First, our sample consists of working students in new ventures, allowing us to isolate the effects of EL acquired at university. However, this focus limits the generalizability of our findings to broader employee and employer populations. Future research should also examine whether similar patterns emerge among mid-career professionals and in established companies to assess whether EL fosters PI across career stages and firms.

Second, while we examined the moderating roles of gender, firm size, and firm age guided by RCT, other individual- and organizational-level boundary conditions may influence the EL–PI relationship. Indeed, although the GUESSS database comprises a rich, worldwide dataset, it provides secondary data, limiting our ability to access other primary information regarding employers. For example, organizational culture and leadership styles could shape how EL translates into PI. Future studies could explore these additional contingencies to develop a more comprehensive understanding of the contingencies in the EL-PI relationship.

Third, our study relies on self-reported measures of PI, potentially introducing response biases. Future research could enhance measurement rigor by incorporating multi-source evaluations, such as supervisor or peer assessments of PI.

Additionally, adopting a longitudinal research design could provide insights into how EL-driven PI influences long-term career progression and organizational performance. For instance, examining the team-level implications of EL-trained employees could uncover whether EL fosters collective innovation or, conversely, leads to conflicts or misalignment within structured organizational settings, thereby highlighting potential dark sides of EL and PI.

Finally, in line with recent work (e.g., Clinton et al., 2024), we rely on gender-based theoretical arguments to derive implications for differences between female and male individuals. Nevertheless, future work would benefit from adopting a nonbinary perspective on gender, which could offer greater nuance and yield a more comprehensive account of organizational expectations are shaped by gendered assumptions.

6.3. Practical implications

Our findings offer practical insights for students, educators, and employers. For students, our results emphasize the importance of cultivating EL through both curricular and extracurricular education, regardless of whether they intend to pursue venture creation. Indeed, our results indicate that higher levels of EL are associated with greater employees' PI. Because PI is highly valued by organizations (Liang et al., 2025), students who develop stronger PI may have better career advancement. Students should actively engage in EL opportunities, including challenge-based learning, student-led entrepreneurial clubs, startup simulations, innovation competitions, and interdisciplinary projects, to develop a proactive mindset that is valuable in all professional settings.

For universities and educators, our results suggest that EL should not only be framed as a tool for fostering venture creation and its antecedents, such as entrepreneurial intention, but also as a means of enhancing employability by equipping students with proactive behaviors that are valuable across various career paths. Designing programs that highlight the applicability of entrepreneurial skills in employment settings, such as challenge-based learning (Mele et al., 2022; Secundo et al., 2020), could enhance their broader relevance. Therefore, as suggested by Belitski and Sikorski (2024), universities need to enhance their dynamic capabilities, streamline processes, and integrate entrepreneurial practices throughout their activities to create robust EL environments that empower students to develop critical skills for their future.

Moreover, for employers, our findings underscore the importance of recognizing and leveraging employees who have invested in EL, overcoming potential biases against the recruitment of entrepreneurial-minded employees (Feng et al., 2024; Kacperczyk & Younkin, 2022; Mahieu et al., 2021). However, organizations should also be mindful of gendered expectations that could limit the full potential of these employees, necessitating inclusive practices that encourage proactive behaviors across all demographic groups. For instance, to reduce gendered role incongruities, they can provide mentorship programs with female entrepreneur role models or inclusive leadership training to ensure that female employees can fully leverage their EL for PI. Furthermore, the moderating role of firm size and age in the EL-PI relationship suggests that smaller and younger organizations, whilst providing a workplace environment rich in PI opportunities, should adjust their norm-based expectations to ensure that entrepreneurial qualities are recognized and rewarded. To address this, smaller and younger firms should reward innovation over mere task expansion, emphasizing the entrepreneurial nature of proactive behaviors rather than just the number of extra-role tasks. Structural adjustments, such as incentive programs that prioritize innovation-driven contributions, can help employees channel their entrepreneurial skills into meaningful workplace improvements. For larger and older organizations, where more structured environments may limit the spontaneous expression of PI, it becomes particularly important to attract employees with EL backgrounds and create environments that nurture EL. This could involve integrating entrepreneurial competencies into recruitment criteria and offering internal training programs that reinforce EL.

7. Conclusion

Several studies have analyzed PI as being cultivated through experiences within organizational settings. However, to the best of our knowledge, there is a surprising lack of understanding of how PI can be developed throughout an individual's education, particularly in university studies. In this study, we examine EL at university as a key antecedent of employees' PI. We drew on RCT and hypothesized that the entrepreneurial qualities developed through EL align with the expectations of proactive and self-starting employees, leading to a positive relationship between EL and PI. Moreover, based on RCT, we also hypothesized that the EL–PI relationship varies across individuals and organizational contexts. We tested these hypotheses using the GUESSS dataset. Our results show that EL significantly fosters PI in employees, thanks to the congruity between entrepreneurial qualities and the employee role. Moreover, the positive effect of EL on PI is greater among male employees, for whom role expectations more closely mirror entrepreneurial qualities. In addition, the positive EL–PI relationship is more pronounced in employees in larger and older firms, as their roles in

these organizations display greater congruity with entrepreneurial qualities. These findings not only extend the scope of EL research beyond new venture creation but also underscore the critical role universities play in developing a proactive, employable workforce. Ultimately, our results offer valuable insights for educators and employers seeking to cultivate dynamic, innovative organizational environments.

CRediT authorship contribution statement

Davide Hahn: Writing – review & editing, Writing – original draft, Supervision, Methodology, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Azzurra Meoli:** Writing – review & editing, Project administration, Methodology. **Giuliano Sansone:** Writing – review & editing, Writing – original draft, Visualization, Validation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix

Table A1
Extra-role behavior scale (adapted from Pearce and Gregersen, 1991).

1	I attend non-required training or educational sessions on own time.
2	I make especially helpful suggestions to improve the start-up.
3	I work before or after regular working hours in order to finish a task.
4	My standards of work quality are higher than the stated standards.
5	I actively seek my suggestions to be adopted by the start-up.
6	I orient new people even though it is not required.
7	I make special attempts to gain more knowledge about job-related techniques and skills.
8	I attend functions that are not required, but that help the start-up.
9	I go out of my way to help others with job-related problems.
10	I look for additional responsibilities despite the fact that it increases my work load.

Note: Items 1 to 5 load on a factor capturing Personal Initiative (PI), our dependent variable; items 6 to 10 load on a separate factor reflecting cooperative-oriented extra-role behaviors.

Table A2
Variables description.

Variable	Description
Personal initiative – PI	Variable based on the exploratory factor analysis of the first five items of a 7-point Likert scale measuring extra-role behaviors (Pearce & Gregersen, 1991).
Entrepreneurial learning – EL	Variable based on the 5-item, 7-point Likert scale developed by Souitaris et al. (2007).
Female	Dummy variable equals to 1 if the respondent is female and 0 if the respondent is male.
Firm size	Variable that indicates the number of employees at the respondent's workplace.
Firm age	Variable that indicates the number of years the respondent's firm has been operating.
Age	Represents the respondent's age in years.
Field of study	Variable that indicates the respondent's field of study, coded as a set of three dummy variables: – Business, Economics and Law (BECL) – Natural Sciences and Medicine (NSM) – Social Sciences and Cultural studies (SSC) (base category)
Level of study: bachelor	Dummy variable equals to 1 if the respondent studies at the bachelor level, and 0 otherwise.
Company position	Variable that indicates the respondent's position level within the company, coded as a categorical variable: – Low-level position for apprentice or intern (base category) – Medium-level position for middle-tier employee – Upper-level position for managerial position
Industry	Set of dummy variables that indicates the industry in which the respondent's firm operates.
Country	Set of dummy variables that indicates the country in which the respondent has filled out the survey.

Table A3
Heckman selection model.

	Model 1	Model 2
VARIABLES	Working student status	PI
Field of study: BECL	0.081***	0.000
	(0.016)	(0.034)
Field of study: NSM	−0.077***	0.032
	(0.016)	(0.035)
Level of study: bachelor	0.055***	−0.036
	(0.015)	(0.032)
Age	−0.001***	0.007***
	(0.000)	(0.003)
Position: medium-level		0.263***
		(0.026)
Position: upper-level		0.658***
		(0.038)
Female	−0.016	−0.056**
	(0.012)	(0.025)
Firm size		−0.463
		(0.314)
Firm age		−0.054***
		(0.017)
mills		−0.091
		(0.130)
Entrepreneurial learning		0.468***
		(0.056)
Entrepreneurial learning*female		−0.048**
		(0.024)
Entrepreneurial learning*firm size		1.048***
		(0.296)
Entrepreneurial learning*firm age		0.052***
		(0.016)
Time at university	0.045***	
	(0.003)	
Constant	−2.012***	−0.402
	(0.021)	(0.366)
Observations	185,779	5,545
Number of groups		938

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$
For variable "Field of study" the omitted category is SSC. For variable "Position" the omitted category is "low-level"

Table A4
Multilevel regression models on the determinants of Personal Initiative (PI) (extended sample).

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
VARIABLES	PI	PI	PI	PI	PI	PI
Field of study: BECL	0.061**	−0.023	−0.021	−0.023	−0.023	−0.021
	(0.029)	(0.028)	(0.028)	(0.028)	(0.028)	(0.028)
Field of study: NSM	0.032	0.019	0.020	0.020	0.019	0.021
	(0.030)	(0.029)	(0.029)	(0.029)	(0.029)	(0.029)
Level of study: bachelor	−0.064**	−0.043*	−0.043*	−0.043*	−0.040	−0.041
	(0.026)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
Age	0.011***	0.010***	0.010***	0.010***	0.010***	0.010***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Position: medium-level	0.295***	0.275***	0.274***	0.274***	0.273***	0.272***
	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)
Position: upper-level	0.704***	0.667***	0.667***	0.668***	0.669***	0.669***
	(0.034)	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)
Female	−0.110***	−0.097***	−0.096***	−0.096***	−0.098***	−0.097***
	(0.021)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)
Firm size	−0.002	−0.003	−0.003	−0.002	−0.003	−0.002
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Firm age	−0.056***	−0.066***	−0.066***	−0.066***	−0.067***	−0.067***
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Entrepreneurial learning		0.229***	0.245***	0.229***	0.229***	0.247***
		(0.010)	(0.015)	(0.010)	(0.010)	(0.015)
Entrepreneurial learning*female			−0.030			−0.032*
			(0.019)			(0.019)
Entrepreneurial learning*firm size				0.020*		0.015
				(0.010)		(0.010)
Entrepreneurial learning*firm age					0.033***	0.031***
					(0.009)	(0.010)
Constant	−0.688***	−0.562***	−0.565***	−0.561***	−0.554***	−0.558***
	(0.156)	(0.150)	(0.150)	(0.150)	(0.150)	(0.150)
Observations	9,102	9,102	9,102	9,102	9,102	9,102
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Sector Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of groups	1,023	1,023	1,023	1,023	1,023	1,023
Log-likelihood	−12047	−11800	−11799	−11798	−11794	−11792
Wald	978.4	1,552	1,554	1,556	1,568	1,574

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$
For variable "Field of study" the omitted category is SSC. For variable "Position" the omitted category is "low-level"

Table A5
Linear regression models on the determinants of Personal Initiative (PI) (standard errors clustered by countries).

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
VARIABLES	PI	PI	PI	PI	PI	PI
Field of study: BECL	0.081**	0.003	0.006	0.006	0.005	0.011
	(0.034)	(0.040)	(0.038)	(0.037)	(0.038)	(0.036)
Field of study: NSM	0.044*	0.028	0.031	0.031	0.028	0.032
	(0.023)	(0.028)	(0.028)	(0.028)	(0.029)	(0.028)
Level of study: bachelor	−0.047	−0.036	−0.037	−0.036	−0.035	−0.035
	(0.031)	(0.038)	(0.038)	(0.038)	(0.038)	(0.037)
Age	0.009**	0.008**	0.008**	0.008**	0.008**	0.008**
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Position: medium-level	0.281***	0.264***	0.263***	0.263***	0.263***	0.261***
	(0.025)	(0.027)	(0.027)	(0.027)	(0.026)	(0.027)
Position: upper-level	0.697***	0.660***	0.658***	0.659***	0.662***	0.659***
	(0.056)	(0.063)	(0.063)	(0.063)	(0.063)	(0.063)
Female	−0.085***	−0.068***	−0.068***	−0.070***	−0.067***	−0.069***
	(0.024)	(0.023)	(0.022)	(0.022)	(0.023)	(0.021)
Firm size	0.009	0.001	0.001	−0.012	−0.000	−0.012
	(0.022)	(0.018)	(0.018)	(0.010)	(0.017)	(0.010)
Firm age	−0.026*	−0.028*	−0.028*	−0.028*	−0.031**	−0.031**
	(0.015)	(0.015)	(0.016)	(0.016)	(0.014)	(0.014)
Entrepreneurial learning		0.209***	0.238***	0.212***	0.210***	0.240***
		(0.045)	(0.051)	(0.043)	(0.042)	(0.045)
Entrepreneurial learning*female			−0.052*			−0.048*
			(0.028)			(0.026)
Entrepreneurial learning*firm size				0.052		0.044
				(0.032)		(0.030)
Entrepreneurial learning*firm age					0.042**	0.038**
					(0.017)	(0.015)
Constant	−0.380**	−0.312**	−0.462***	−0.459***	−0.457***	−0.457***
	(0.171)	(0.153)	(0.151)	(0.153)	(0.155)	(0.151)
Observations	5,564	5,564	5,564	5,564	5,564	5,564
R-squared	0.111	0.154	0.155	0.157	0.156	0.159

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$
For variable "Field of study" the omitted category is SSC. For variable "Position" the omitted category is "low-level"

Table A6
Linear regression models on the determinants of Personal Initiative (PI) (standard errors clustered by universities).

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
VARIABLES	PI	PI	PI	PI	PI	PI
Field of study: BECL	0.081**	0.003	0.006	0.006	0.005	0.011
	(0.035)	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)
Field of study: NSM	0.044	0.028	0.031	0.031	0.028	0.032
	(0.036)	(0.036)	(0.035)	(0.035)	(0.036)	(0.035)
Level of study: bachelor	−0.047	−0.036	−0.037	−0.036	−0.035	−0.035
	(0.034)	(0.033)	(0.033)	(0.032)	(0.033)	(0.032)
Age	0.009***	0.008***	0.008***	0.008***	0.008***	0.008***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Position: medium-level	0.281***	0.264***	0.263***	0.263***	0.263***	0.261***
	(0.026)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
Position: upper-level	0.697***	0.660***	0.658***	0.659***	0.662***	0.659***
	(0.041)	(0.040)	(0.040)	(0.039)	(0.040)	(0.039)
Female	−0.085***	−0.068***	−0.068***	−0.070***	−0.067***	−0.069***
	(0.023)	(0.023)	(0.022)	(0.022)	(0.023)	(0.022)
Firm size	0.009	0.001	0.001	−0.012	−0.000	−0.012
	(0.013)	(0.013)	(0.013)	(0.014)	(0.013)	(0.014)
Firm age	−0.026**	−0.028**	−0.028**	−0.028**	−0.031**	−0.031**
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Entrepreneurial learning		0.209***	0.238***	0.212***	0.210***	0.240***
		(0.015)	(0.019)	(0.015)	(0.015)	(0.019)
Entrepreneurial learning*female			−0.052**			−0.048**
			(0.022)			(0.022)
Entrepreneurial learning*firm size				0.052***		0.044**
				(0.018)		(0.018)
Entrepreneurial learning*firm age					0.042***	0.038***
					(0.011)	(0.011)
Constant	−0.380**	−0.312**	−0.462***	−0.459***	−0.457***	−0.457***
	(0.153)	(0.144)	(0.128)	(0.128)	(0.129)	(0.128)
Observations	5,564	5,564	5,564	5,564	5,564	5,564
R-squared	0.111	0.154	0.155	0.157	0.156	0.159

Standard errors in parentheses
*** p < 0.01, ** p < 0.05, * p < 0.1
For variable "Field of study" the omitted category is SSC. For variable "Position" the omitted category is "low-level"

Data availability

The authors do not have permission to share data.

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